SYSTEM AND METHOD FOR CONTROLLING MEDIA GATEWAYS THAT INTERCONNECT DISPARATE NETWORKS

TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to the field of telecommunications, and more particularly to a system and method for controlling media gateways that interconnect disparate networks.

BACKGROUND OF THE INVENTION

The Universal Mobile Telecommunications System (UMTS) specifies Q.2630 as the control protocol used for establishing and releasing circuit switched Application Adaptation Layer type 2 (AAL-2) bearer channels. UMTS voice and circuit switched data are carried in a compressed discontinuous manner. These streams are ideal candidates for AAL-2 Virtual Channel Connections (VCCs).

ITU-T Q.2630 is a transport control protocol designed to control ATM (Asynchronous Transfer Mode) AAL-2 connections. AAL-2 provides for multiplexing multiple low bit rate and low latency data streams onto a single ATM virtual circuit. Q.2630 defines an AAL-2 VCC as a path. A path is identified by a Path Identity (PID). A single path carries multiple AAL-2 channels, each channel referenced by a Channel Identifier (CID).

ATM AAL-2 connections may be controlled by the Q.2630 bearer control protocol. Transmission savings may be realized by carrying voice traffic generated in a Time Division Multiplexed (TDM) network over a more efficient AAL-2 ATM network. At the transition from the TDM network to the AAL-2 network, a media gateway acts as an interface between the AAL-2 channel and the TDM channel.

When a voice path is to be established between a calling party and a called party, the call originating and call terminating nodes may select different communication paths. For example, the originating node may select a TDM circuit associated with a particular media gateway while the terminating node may select an ATM VCC associated with a different media gateway. This causes a problem in establishing the voice path which may require the use of switching equipment between the media gateways.

SUMMARY OF THE INVENTION

Accordingly, there is a need in the art for a system and method for controlling media gateways that interconnect disparate networks, for example a packet network, such as an Asynchronous Transfer Mode (ATM) network, and a Time Division Multiplexed (TDM) network. In the preferred embodiment, this is accomplished by modifying a channel selection procedure for a call terminating node. In the preferred embodiment, this is accomplished by modifying the Q.2630 channel selection procedure for the call terminating node such that the ATM channel is selected from a subset of channels associated

with the media gateway which is associated with the TDM circuit selected by the call originating node.

In accordance with an embodiment of the present invention, a system for controlling media gateways is disclosed. The system comprises a Mobile Switching Center (MSC) operable to select a TDM circuit associated with a media gateway of a plurality of media gateways in response to receiving a circuit service call setup request from a mobile system. The system also comprises a signaling gateway operable to translate an address of the selected TDM circuit into an address of the media gateway with which the selected TDM circuit is associated. The system further comprises a Radio Network Controller (RNC) operable to select an ATM Virtual Channel Connection (VCC) of a plurality of ATM VCCs associated only with the media gateway based at least in part on the address of the selected media gateway, in response to receiving a request for a channel, the RNC further operable to transmit information regarding a selected channel of the selected ATM VCC to the MSC for establishment of circuit service call.

In accordance with another embodiment of the present invention, a method for selecting a circuit service call channel is disclosed. The method comprises receiving a request for a circuit service call channel, the request comprising information identifying a media gateway selected out of a plurality of media gateways, the selected media gateway having a TDM circuit selected out of a plurality of TDM circuits associated with it; selecting an ATM VCC from a plurality of ATM VCCs associated only with the selected media gateway; and

transmitting an Establish Request (ERQ) to a Q.2630 module of a signaling gateway.

Other aspects and features of the invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, the objects and advantages thereof, reference is now made to the following descriptions taken in connection with the accompanying drawings in which:

FIGURE 1 is a schematic diagram of a system for controlling media gateways that interconnect disparate networks according to a preferred embodiment of the present invention; and

FIGURE 2 is a preferred embodiment dataflow diagram for controlling media gateways that interconnect disparate networks.

DETAILED DESCRIPTION OF THE DRAWINGS

The preferred embodiment of the present invention and its advantages are best understood by referring to FIGURES 1 through 2 of the drawings.

FIGURE 1 is a schematic diagram of a system 100 for controlling media gateways that interconnect disparate networks according to a preferred embodiment of the present invention. System 100 comprises a call originating node 102, a call terminating node 104, a

signaling gateway 106, and a plurality of media gateways 108, 110 and 112. Call originating node 102 is preferably coupled to signaling gateway 106 and media gateways 108, 110 and 112. Call terminating node 104 is preferably coupled to signaling gateway 106 and media gateways 108, 110 and 112.

Call originating node 102 is preferably a legacy Time Division Multiplexed (TDM) element, such as a Mobile Switching Center (MSC) that includes a RANAP (Radio Access Network Application Protocol) module 114. Call terminating node 104 is preferably a Radio Network Controller (RNC) that includes a RANAP module 116 and a Q.2630 module 134. RANAP modules 114 and 116 terminate the RANAP signaling. The RANAP layer preferably carries the messaging between a mobile system and the MSC and also the messaging between the RNC and the MSC. Signaling gateway 106 preferably comprises a Q.2630 module 130 and a RANAP module 132. Media gateways 108, 110 and 112 are each preferably a Voice Signal Processor (VSP). Each media gateway is assigned an AAL-2 End Station Address (AESA).

One or more packetized voice or data connections, such as ATM Virtual Channel Connections (VCCs) 118, 120, and 122, for example one or more AAL-2 VCCs, couple each media gateway to RNC 104. Each AAL-2 VCC is assigned a Virtual Channel Identifier (VCI) which is used as the VCC's Path Identity (PID). There is no mechanism to force the PIDs of VCCs on different media gateways to be unique even if the media gateways are associated with the same RNC. Thus, VCCs on different media gateways may have the same PID. Each VCC comprises one or more channels. Each channel is assigned a Channel Identifier

(CID). In the embodiment illustrated in FIGURE 1, ATM VCC 118 couples media gateway 108 to RNC 104, ATM VCC 120 couples media gateway 110 to RNC 104 and ATM VCC 122 couples media gateway 112 to RNC 104.

One or more TDM circuits 124, 126 and 128 couple each media gateway to MSC 102. In the embodiment illustrated in FIGURE 1, TDM circuits 124 couple media gateway 108 to MSC 102, TDM circuits 126 couple media gateway 110 to MSC 102 and TDM circuits 128 couple media gateway 112 to MSC 102.

FIGURE 2 is a preferred embodiment dataflow diagram 200 for controlling media gateways that interconnect disparate networks. MSC 102 receives a circuit service call setup request 202 from a mobile system. Setup request 202 is preferably a request for establishing a voice path and preferably includes the phone number of the called party. If desired, in an alternative embodiment, setup request 202 may be a request for establishing a data path, for example a circuit switched data path. Setup request 202 is preferably carried in a RANAP message. MSC 102 selects a TDM resource, for example one of the TDM circuits 124, 126 or 128 on one of the media gateways 108, 110 or 112 at the edge of the ATM network.

MSC 102 transmits a RAB (Radio Access Bearer) assignment request 204 to RNC 104 preferably via signaling gateway 106. RAB assignment request 204 is preferably carried in a RANAP message. MSC 102 adds a unique Bind Identity (BID) to the RAB assignment request. The BID identifies the TDM circuit that the AAL-2 channel should bind to. If desired, the BID may also identify the associated RANAP transaction. The RAB request is

preferably a request for a circuit switched channel, for example a voice channel, a data channel, and/or the like. Signaling gateway 106 controlling the media gateway with which the selected TDM circuit is associated translates the selected TDM circuit address into an AAL-2 End Station Address (AESA) of the media gateway. The AESA of the selected media gateway includes a media gateway identifier MG_i identifying the media gateway associated with the selected TDM circuit.

RNC 104 selects an ATM VCC based at least in part on the AESA included in RAB request 204. Preferably, RNC 104 is limited to selecting an ATM VCC from the plurality of ATM VCCs that couple RNC 104 with the media gateway associated with the selected TDM circuit only. This ensures that the TDM circuit selected by MSC 102 and the ATM VCC selected by RNC 104 are each coupled to the same media gateway.

Q.2630 module 134 on RNC 104 then transmits an Establish Request (ERQ) 206 to Q.2630 module 130 on signaling gateway 106. ERQ 206 is preferably a request for an ATM channel, for example an AAL-2 channel. As mentioned above each ATM VCC has a PID assigned to it. ERQ 206 includes a Served User Generated Reference (SUGR) parameter that includes the BID assigned to the selected TDM resource by call originating node 102. ERQ 206 preferably also includes the PID of the selected ATM VCC.

An available channel is selected from the ATM VCC. Signaling gateway 106 sends control messaging to the media gateway with which the selected TDM circuit is associated instructing it to connect the TDM circuit identified with the BID to the AAL-2 channel identified by the channel ID. If successful, signaling gateway 106

sends an Establish Confirmation (ECF) message 208 back to RNC 104. RNC 104 transmits RAB response 210 back to MSC 102. MSC 102 switches the voice path to the selected media gateway. Thus, the voice path is established.

By restricting the ATM network's AAL-2 path selection to a set of AAL-2 VCCs that fall on the media gateway associated with the TDM circuit selected by the TDM network, the cost of switching in the media gateway between the ATM and TDM networks is avoided. This allows production of less costly and more scalable media gateways.

The preferred embodiment of the present invention allows for optimization of ATM to TDM gateways without modification of the legacy TDM element, for example the MSC. In the preferred embodiment, the need for switching equipment between the media gateways is eliminated. Additionally, media gateways may be added as desired allowing for a scalable transition point between the two networks.

Although the preferred embodiment of the present invention has been described herein with reference to ATM and TDM networks, the invention is not so limited. If desired, the teachings of the present invention may be utilized with reference to other types of network. For example, in an alternative embodiment, the TDM network may replaced by another ATM network. In such an embodiment, the system for controlling media gateways comprises an MSC operable to select an AAL-2 path associated with a media gateway of a plurality of media gateways in response to receiving a circuit service call setup request, for example a voice path setup request, a circuit switched data path setup request, and/or the

like, from a mobile system. The system also comprises a signaling gateway operable to translate an address of the selected AAL-2 path, for example a BID identifying the selected AAL-2 path, into an address of the media gateway, for example an AESA including an identifier identifying the media gateway, with which the selected AAL-2 path is associated. The system further comprises an RNC operable to select an ATM VCC of a plurality of ATM VCCs associated only with the selected media gateway in response to receiving a request for a channel, for example a RAB assignment request. The RNC is further operable to transmit information regarding a selected channel of the selected ATM VCC to the MSC for establishment of the circuit service call.

The system further comprises a first Q.2630 module operable to receive an establish request for the selected channel from a Q.2630 module of the RNC. The establish request comprises a PID of the selected ATM VCC and a BID of the selected AAL-2 path.

While the invention has been particularly shown and described by the foregoing detailed description, it will be understood by those skilled in the art that various other changes in form and detail may be made without departing from the spirit and scope of the invention.